PRELIMINARY ENGINEERING REPORT

ON

THE ST. FRANCOIS COUNTY LANDFILL

Seiberling Engineering & Surveying Co.
Bonne Terre, Missouri

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FOREWORD: The following engineering report is submitted in accordance with the provisions of Senate Bill No. 387 enacted by the Second Regular Session of the 76th General Assembly and the Preliminary Draft prepared by the Division of Health of Missouri which outlined the Sanitary Landfill Engineering Plan Requirements.

It is understood that the Missouri Division of Health has not yet adopted rules and regulations. Hence, and changes and additions to their preliminary draft will in turn require changes and additions to this engineering report.

The actual site of the proposed landfill was examined by representatives January, 1972, and it was found that this site can be satisfactorly utilized for a sanitary landfill provided it is properly engineered, operated, and certain precautions are taken. The location, topography, and soil characteristics were considered satisfactory for a sanitary landfill operation and the proposed site was approved by the Chief of Community Sanitation of the Missouri Division of Health on January 21, 1972. Along with the approval was the requirement that an engineering plan showing the operational practices, trench locations, roads, drainage, cover materi drainage structures, buildings, diversion ditches, dams, etc. be submitted along with the outline of operation to be filed with the Division of Health before the landfill is put into operation.

The necessary lands were acquired by the County Court of St. Francois County and a non-profit corporation consisting of said County Court and the municipalities of the County, was formed to operate the county landfill.

THE LANDFILL SITE: The St. Francois County Landfill Site consists of a large tract of land lying north and west of the City of Desloge and roughly in the north-central part of the county. A satisfactory system of all-weather roads makes it available for use by all of the municipalities of the county.

The actual site consists of 355.04 acres in US Survey No. 2164, 4.68

acres in Fractional Section 25, 8.33 acres in Fractional Section 26, 14.91 acres in Fractional Section 35, 39.07 acres in Fractional Section 36, 70.69 acres in US Survey No. 3176 and 11.10 acres in US Survey No. 870 or an aggregate of 503.82 acres, more or less, all in Township 37 North, Range 4 East. Many years ago, this site had been used by the St. Joseph Lead Company as a tailing disposal area. Tailing dams had been constructed across the ravines forming a huge lake into which was pumped the fine-ground barren dolomite fragments from the milling operations. These fine-ground fragments, locally called slimes, were pumped with mill water thru a system of huge pipes into the upper end of the lake or slime pond. Here, the slimes settled out and the water collected in the lower part ofthe pond where the top few inches were allowed to flow out thr a system of drain towers to Big River. Thus, over a period of many years, layer upon layer of the slimes built up with a gentle slope downward in the direction of the drain tower. Since the slime dams were impervious, some water remained in the slimes filling their voids. When the Desloge mill was shut down nearly 20 years ago, no water other than natural rain-fall was added to this slime pond. Hence, the top layer of slimes tended to dry out while the bottom layers remained damp and tended to farther become compacted. Today, the Desloge slime pond resembles a white desert. With proper base and compaction, roads may easily be built across it. The new US Highway No. 67 was constructed across the Bonne Terre slime pond only a few years ago. No great difficulties were encountered. Track vehicles may move freely across the surface of the slime pond, but a wheeled vehicle such as an auto soon would get stuck in the fine soft slimes. In the western part of slime pond, a ridge top consisting of mostly ~~of~~ red clay soil on limestone bedrock protrudes above the level of the slimes. The actual slimes range in thickness from 0 where it laps on the ridge tc some 80 feet in the deepest part of the old ravine system.

Since the bottom and sides of the entire slime pond are practically impervious, only rainfall has added water since the Desloge Mill was shut down many years ago. This surface water runs to the lowest points which are the inlets of the drain towers. Evaporation takes care of a large percentage of the rainfall. Experience has indicated that the average slime pond will continue to slowly loose moisture and hence dry out from the surface downward. It is indicated that there is practically no lateral movement of water below the few feet of fine dry slimes.

THE LAND-USE MAP: Portions of the Bonne Terre and Flat River 7½' USGS Quandrangle Maps were pasted together and blown up the approximate scale of 1"= 1000 ft. These maps indicate both the topography and the works of man. The road network, streets of Desloge, and buildings are clearly indicated.

A public water supply well located at Gumbo and one located in Desloge are both over 5,000 feet from the nearest boundary of the proposed landfill. A few residences located south of the slime pond have drilled wells but all of these are on the opposite side of the slime dam of the landfill site. Due to the impervious nature of the slime dam and pond, it would not be possible for any ground water to flow from the slime pond to these wells. Any surfacr run-off would flow into the concrete overflow tower located about 900 feet east of the northeast corner of US Survey No. 870. Here, the run-off would drop about 60 feet to a tunnel under the south slime dam where it would flow in a southeast direction about 300 feet and discharge into a surface streambed or drain. Here, a tunnel cut thru solid rock and running in a northwest direction for about 2,000 feet discharges into a surface drain running in westerly direction for about 300 feet where it discharges into Big River.This drain tunnel carries all the surface run-off from the surface drainage system running in a northerly direction across thecenter of Section 1 and US Survey No. 870. It was driven over 50years ago, and before the south slime dam was constructed.

No gas, water, sewer, electric or other easements are located on the landfill site.

A public all-weather road is being constructed along the trace of thepresent graveled road leading to the Desloge City Dump (which is to be closed). This new all-weather road will run in an easterly direction along the top of thesouth slime dam to the first of the landfill cells (see County Landfill Site Map). However, only the contractor's disposal vehicles will use this road beyond the Landfill Office.

The contractor's trucks hauling solid wastes from all over the County will travel on Missouri State Highway No. 8 to the intersection of State Route P located in the Northwest Quarter of Section 1, Twp.36 North, Range 4 East. Both of these State highways have adequate bridges for loads much heavier than the contract solid waste trucks. The new all-weather road will not require and cause additional bridging. It will probably be blacktopped to the landfill entrance gate located at the southwest corner of the property.

TEST BORINGS: T o date, no test borings have been made for thim landfill. however, this is an artificial or rather, built-up area where very fine-ground dolomite and limestone has been deposited in thin layers over a long period of time (years). Some prospect drilling was dcne by the Lead Company in this area. First it was necessary to drive sleeves down to solid earth and then drill cores with a diamond drill. Inside this slime pond, we have a form of isolated water table where on the highest points the slime has dried down to a point 15 to 20 feet below its present surface. In the lowest point which now is the southwest corner of the area, a pond has existed for many years. Fifteen to 20 years ago, the Writer caught fair bass out of this pond. Now, a drain ditch was opened up to the concrete overflow tower and the pomd is practically dry. Time did not permit running levels to determine the actual elevations. Elevations will be run in the near future for purposes of making the required contour map and will also show the bottom of this old pond/ As previously mentioned, the slimes vary in depth from 0 to over 80 feet depending on the surface of the ground before the slime pond was built up to its present level.

PROPOSED OPERATING PROCEDURES AND CONTROLS:

a. Type and Volume of Solid Waste to be Received: Other than the special type of wastes such as: liquids, sewage sludge, toxic materials, explosives, pathological wastes and the like, only the normal type of solid wastes are anticipated from the various towns and communities.

For volume, the University of Missouri at Rolla gave us a figure of about 0.7 tons of waste per person per year as the present average. It was estimated that the landfill would be operated 313 days per year. Then by taking the present population of each of the contributing towns, villages and areas coupled with the present effective collection factors, we arrived at the figure of 18,851 tons of waste per year to be handled by the landfill. This breaks down to 61.7 tons per operating day which after optimum compaction amounts to 123.4 cu. yds per operating day (see Table 1 for details).

b. Special Wastes: The special wastes listed in (a) above will not be received at this landfill under present planning. Should the needs occur at some future date to handle any of the above listed types, a special study will be made at that time and the resulting plans will be submitted to the Missouri Division of Health Authorities for approval.

Plans do call for the separation of organic wastes such as tree limbs, trunks, stumps, and construction wastes such as lumber, bricks, etc. from the regular compaction feed. A special site will be set up for this type of waste separate from the cells to be worked by the compactor.

c. Wet Weather Operations: Wet weather will have very little effect upon the actual operations of the landfill other than contributing to the discomfort of the operator and obscuring his vision. The fine slime will compact slightly when wet and will give better traction. A diversion ditch would be cut with the dozer to prevent a surface flow of rainwater into the actual cell being filled. Both the daily cover and the intermediate cover will be as easily handled in a wet weather state as in a dry state. However, the final cover of a minimum of 24" of clay will not be placed during wet weather. Since the roads will be all-weather, the compactor should be able to handle any material that the trash hauling contractors will bring to the site during wet weather.

d. Dust, Fire, Gas and Erosion Control: Under average conditions, the fine dry slimes offer a problem in dust control. Dust has been a serious problem in all of the local slime fields. The Lead Company has tried various schemes over the past 30 years ranging from about two feet of clay cover to planting various types of vegetation and grasses. The clay cover worked very well, and some of the grasses seem to offer promise. In working in the actual cell, when the strong Spring winds create a problem, it probably will be necessary to wet down the surface of the slimes down-wind with a spray of water from a water tank truck.

Since no burning will be permitted on this landfill site, fire should be no problem. Should vandals light fires, a capable near-by rural fire department has been contracted with to respond upon need. There will be a telephone at the landfill office for emergency communications. Since no salvaging will be permitted, no unauthorized persons should be on the property.

Gas will be no problem since the fine chat cover will not trap and hold any type of gas.

Erosion will be controlled by means of diversion ditches and then by the final 24" clay cover. This final cover will be seeded with a suitable grass seed to further control erosion.

e. Ground Water Elevation: As already mentioned, this landfill site is bound by impervious dams. The bottom is also impervious due to the layers of fine slimes. Hence, we have a huge area entirely separated from the normal ground water of the district. Any leachate formed in the cells will be contained within the bounds of the slime pond, and in most cases, in the bottom of the cell. Lateral movement of water in this trapped ground water body is practically nil due to the enclosing dams. The water table within this slime pond area may be expected to be deeper below the surface than that of the outside area. It became stabalized many years ago when the mills were shut down and no new slimes were pumped into it.

Care must be taken not to attempt to locate cells in the lower parts of the slime pond where the water table is practically at the surface. Here the danger is to the equipment for the moist slimes act somewhat like a bog. A heavy machine could become entrapped such a spot.

The drain towers of the slime pond actually control the elevation of the ground water within it. Since the drain boards have not been moved for years, we may assume that the water table has become stabilized and that there is practically no lateral movement or flow in the ground water. Hence, it is important not to tamper with the drain towers unless it is desired to either raise or lower the water table.

f. Equipment: The primary piece of equipment to be used in the conduct of the landfill operation will be a new JOHN DEERE MODEL JD 646 LANDFILL COMPACTOR. The back-up and complementary piece of equipment will be a Caterpillar D-6 Dozer Shovel. A dump truck of medium size will be used for utility purposes. An adequate maintenance and storage shelter for the equipment has already been constructed at the site, near the entrance.

g. Operating Procedures: Detailed records shall be kept concerning all waste input with regard to volume, source, category, and type of haulage. All traffic flow will be controlled, as will all unloading procedures. This will be accomplished by the use of access route control, signs, and personnel actions. No traffic other than commercial carriers will be permitted beyond the gate area. Absolutely no salvaging or burning activities will be permitted on the landfill property. Litter control will be exercised by the use of portable screening, excavation berm siting and such other measures as are necessary.

The working face of each cell shall be kept as small as efficiency and safety will allow. Waste shall be spread in layers not to exceed 2 feet prior to compaction, and covered daily with at least 6 inches of compacted material. Intermediate cover shall be 12 inches and final cover 2 feet. Appropriate draingge continuity shall be maintained at all times.

The landfill manager shall maintain continuing supervision over all facets of operation. The Board of Directors of the Landfill Corp. will exercise operational monitoring and analysis.

VARIOUS STAGES OF THE OPERATION: The landfill site will be divided into a number of areas for the convenience of operation. The actual landfill cells will be about 25 feet wide by 100 feet in length and 8 feet in depth. Initially, a space of about 10 feet between cells is planned. However, experience in actual operations may indicate that this space between cells is not necessary. The Engineering Geologist recommended that no trench or cell be nearer than 300 feet to the edge of the slime pond. This was intended primarily as a safety factor to prevent the erosion of slimes into the Big River.

The first area of operation, called Area 1 on the map for convenience, is the + 81 acre tract lying south of the north line of US Survey No. 3176 (see Map II). The access road will be constructed along the top of the slime dam along the south property line. Here the surface will be graded to drain toward the north so that rain water will run into the slime pond instead of toward the south and eroding off part of the dam like it is at the present. The landfill office and equipment shed have already been constructed near the entrance gate in the southwest corner of the property.

In Area 1, the cells must be kept a minimum of 300 feet from both the south and the west property lines. On the east side where the big chat pile laps down on the slime field, the cells should be at least 50 feet west of the property line. The long axis of the cell should parallel this east property line. The first cell should be located about 300 feet north of the south property line and 50 feet west of the east property line and extend toward the north. The next row of cells would be west of the first row and parallel to it. Due to the characteristics of the slime pond as a whole and its encircling dams, there is little danger of any leachate escaping from it, no matter what system is used. Operations may indicate that a continuous trench 25 feet wide and the entire length of the area might be more effecient than a series of cells. In any case, care must be taken not to run heavy equipment over the southwest end of this area in the low spot formerly occupied by a small pond. It could be given suitable bearing power by fill if necessary.

When Area 1 is finished, Area II will be opened for landfill operations. Area II is the approximate 80 acre tract north of and adjacent to the north line of Area 1 and lying south of the south line of US Survey No. 2164. In turn, Area III will be the next approximate 80 acres lying north of Area II. Based upon the actual experience in landfill operations to be gained in AreaL1, it is quite possible that these preliminary plans will be greatly improved. Landfill operations in a slime pond area under controlled conditions and planning is something new to this area. The Bonne Terre City Dump was operated in the west part of an old slime pond and actually outside the dam. It was an uncontrolled cut and fill method where the individual dumped about anything where he pleased. However, it was noted that the fine chats made excellent cover.

No changes are planned for the surface drainage other than cutting diversion ditches to route any heavy surface run-off around the cells instead of into them. As mentioned earlier, the old concrete drain-towers and system of underground tunnels will continue to carry the surface run-off as before.

A heavy cable serves as a gate at the southwest property corner and will be closed except when the landfill is operating. Private individuals vehicles will be restricted to trash hoppers at the entrance. No salvaging of any type will be permitted. This will enable the landfill operator to control all of the necessary operations. Any additional fencing will be erected when the needs are evident.

Litter control will be effected by the use of portable screens and hoppers as well as excavation berm siting. Since the landfill cannot be in operation during certain times, such as Sundays and holidays, a comprehensive effort concerning litter control will be essential for the area. This should involve law enforcement, citizen involvement, and the news media.

The necessary landfill office and equipment structure has already been constructed and an experienced heavy equipment operator has been engaged to both operate and service the equipment.

CROSS SECTIONS AND CALCULATIONS: Time did not permit the completion of this part of the report. The field work will be completed in July after the writer returns from vacation. Calculations will be completed at this time. As previously mentioned in this report, there is adequate dry slimes for the daily and intermediate cover. There is also adequate clay soil for the final cover located along the western boundary of the landfill site (see Map II).

LEACHATE: As previously mentioned, due to the surrounding slime dams which are water-proof, this entire landfill area is sealed off from the ground waters of the county and other than by cutting a dam, there is practically no danger of polluting the ground and surface waters outside of the dams. It has already been mentioned that the discharge level of the old concrete drain towers must not be lowered. Leachate collection and treatment is not proposed. (see Geologist's report attached hereto).

TOPOGRAPHICAL MAPS: The necessary maps will be completed as soon as the above-mentioned cross sections and necessary field work are completed. Due to the gentle slopes which prevail over the slime field, it will be necessary to use two-foot contours.

PROPOSED FINAL USE OF THE DISPOSAL AREA: Due to the scenic location of the entire landfill site within the sort of horse-shoe bend of Big River, it is recommended that this area eventually be made into a huge recreation area and public park. Once the entire surface of the slimes is covered with clay and properly seeded, the necessary steps required to convert it to a park are minor in nature. Actual plans have not yet been formulate along these lines, since its implementation lies several years in the future. Additional lands such as the approximate 30 acre tract in the US Survey No. 2105 lying west of Big River, should be acquired and incorporated into any sort of recreational planning.

Respectfully Submitted,

T.C. Seiberling

T.C. Seiberling, PE

St. Francois Co.

ENGINEERING GEOLOGICAL REPORT
BONNE TERRE-ST. FRANCOIS COUNTY LANDFILL SITE

The tailings ponds or slime piles located in section 25 and 36, T. 37 N., R. 4 E., have been examined for feasibility utilizing the slime piles for sanitary landfill sites. This area will be satisfactory for the trench type method, as the slime deposits are composed of very fine ground limestone and dolomite fragments and the tailings are quite thick, ranging from 0 to an excess of 80 feet. Little or no solution problems of either the subsurface or surface waters will be encountered if certain precautions are met.

The depth of the trench will be restricted primarily to the safe depth in which the equipment can operate within the tailings pond area. The material taken from the trench can be used quite affectively for daily cover. It is recommended that the final cover be soils pulled off from the untouched land or natural ground nearby. The soil over the bedrock in this area on the ridges varies from 5 to 32 feet. Due to the unevenness it is not recommended that these sites be utilized for sanitary landfill, but for borrow area only, and this be reserved for the final cover. It is further recommended that the final or the outer most trench be restricted to 300 feet from the edge of the tailings pond area, or the crushed limestone. This is primarily a safety feature to prevent erosion of the ground limestone into the Big River and upset the ecological balance of that stream. If these minor precautions are taken, little or no surface or groundwater pollution will occur from this operation. It is recommended to the State and County Health Departments that this site be utilized for a sanitary landfill operation.

Edwin E. Lutzen
Geologist
Engineering Geology Section
Missouri Geological Survey
January 18, 1972

TABLE I

BASED ON 313 CP. DAYS

AGENCY	TOTAL INPUT TONS	TONS P/DAY	CY/PD COMP.	CY/PD NON-COMP.
FARMINGTON	4922	15.7	62.8	104.56
FLAT RIVER	3185	10.2	40.8	67.27
BONNE TERRE	2535	8.0	32.0	53.28
DESLOGE	1972	6.3	25.2	41.96
BISMARCK	971	3.1	12.4	20.65
ELVINS	1122	3.6	14.4	23.98
ESTHER	730	2.3	9.2	15.32
LEADWOOD	978	3.1	12.4	20.65
TERRE DU LAC	1686	5.4	21.6	36.02
HOSPITAL # 4	750	2.4	9.6	15.84
STARTING TOTALS	18,851	61.7	246.8	410.9
After optomium compaction			123.4	